Automized quality assurance of sensors for the CBM Silicon Tracking System*

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The Silicon Tracking System is the main tracking detector of the Compressed Baryonic Matter (CBM) experiment. It will comprise 8 stations that will be built out of around 1200 double-sided silicon microstrip sensors. The sensors will be AC-coupled and have 7.5 degree stereo angle between p- and n-side strips. The latest sensor prototypes, CBM05, manufactured by CiS, are currently being evaluated for their parameters before the series production will take place [1].

To achieve the required tracking efficiency of the whole tracking system, each sensor has to be evaluated in a number of quality assurance procedures. Some of those allow checking the overall sensor health, as it has already been done with earlier sensor prototypes [2]. This report emphasizes on the procedure that has been developed for an advanced quality assurance tests applying to the sensors that have been accepted after the basic check.

The procedure itself comprises automization with LabView software and involves the use of the following equipment: a wafer prober Süss PA300PS with a mechanical accuracy of 2 μm, picoampere meters Keithley 6487 and 2410, and a LCR meter Quad Tech 7600. The following advanced quality tests of silicon sensor can be realized: (a) number of pinholes, (b) leakage current of each strip, (c) number of shorted strips, (d) number of ragged strips. The measurements are being performed in a clean room with temperature and humidity control.

The software includes two communicating programs developed on a master and slave principle, installed on two personal computers. The master program communicates with the measuring devices and generates the commands for the slave program which in turn manages the wafer prober perfomance.

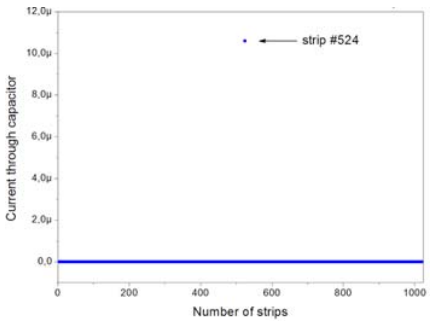

Figure 1: Result of strip current test for CBM03' sensors.

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The pinhole measurement provides information about defected strips with disrupted capacitive coupling and which cannot be used for charge collection. Figure 1 indicates the result of the pinhole test of CBM05 sensor prototype detecting one broken capacitor on the p-side of the sensor. Table 1 summarizes results of pinhole measurements for different prototype sensor.

Table 1: Results of the pihole tests for CBM03' and CBM05 sesnor prototypes

Sensor Prototype	Sensor Size	Wafer Number	Number of pinholes *p-side*	*n-side*
CBM03'	Full size	7	0	-
CBM03'	Full size	10	5	-
CBM03'	Full size	13	0	-
CBM05	Full size	4	0	4
CBM05	Full size	6	0	0

Measurement of the leakage current of individual strip helps us to identify the number of strips having relatively high leakage current which have to be masked in the read-out electronics. Figure 2 shows the distribution of strip leakage currents of one prototype sensor. If the number of defective strips is below a certain quality acceptance threshold, the sensor can be used for module assembly and only the bad strips should not be connected to the read-out electronics. Otherwise, the sensor should be discarded.

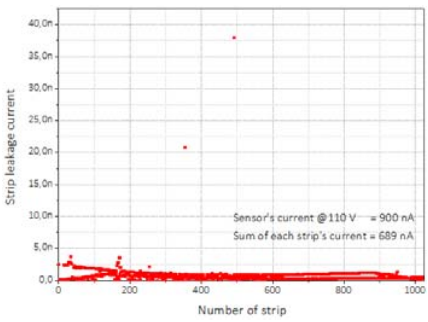

Figure 2: Result of strip current test for CBM03' sensor prototype.

References

[1] J. M. Heuser *et al.*, CBM Progress Report 2012, Darmstadt 2012, p.8

[2] P. Larionov and P. Ghosh, CBM Progress Report 2012, Darmstadt 2012, p.11

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